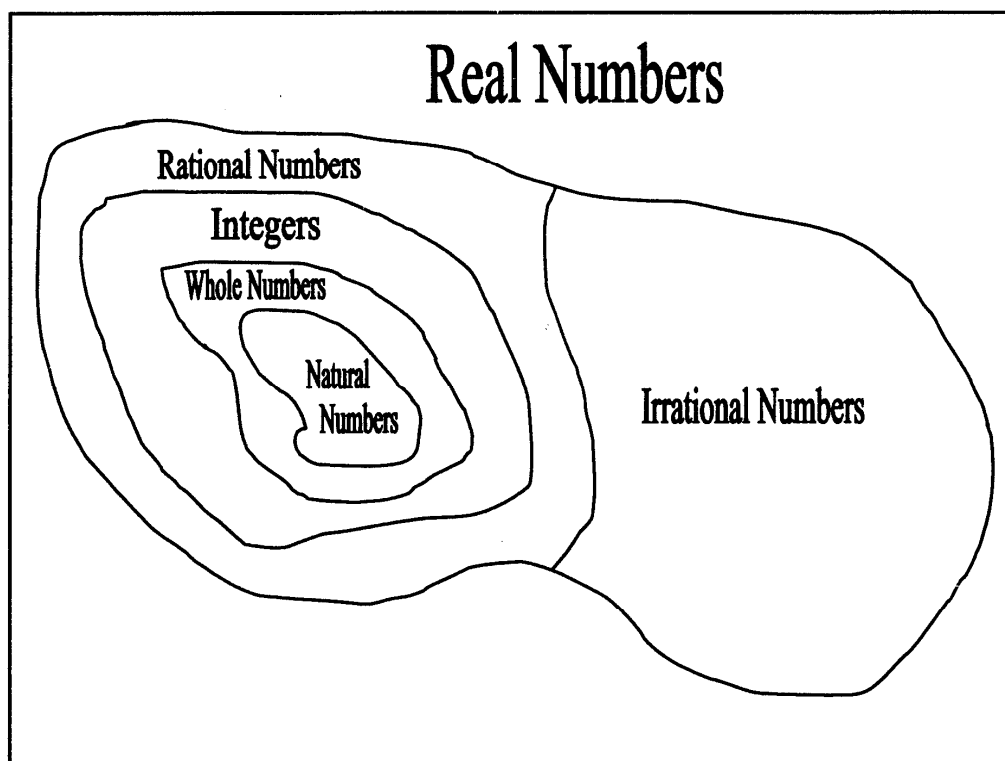


The Number System



1. Natural Numbers: Natural Numbers (also known as the counting numbers) are the set of numbers beginning with the number 1 and going to infinity.

$$N = \{1, 2, 3, 4, \dots\}$$

2. Whole Numbers: Whole Numbers are the set of natural numbers including 0 and continuing through infinity.

$$W = \{0, 1, 2, 3, \dots\}$$

3. Integers: Integers are the set of all whole numbers and their opposites.

$$I = \{\dots, -3, -2, -1, 0, 1, 2, 3, \dots\}$$

4. Rational Numbers: Rational Numbers are the numbers that can be expressed as a ratio or a quotient of integers, excluding the possibility of a zero denominator. In other words, rational numbers are any numbers that can be expressed as a

fraction. For example, 5 is rational because it can be written as $\frac{5}{1}$; 0.25 can be written as $\frac{25}{100}$ or $\frac{1}{4}$; -0.3 can be written as $-\frac{1}{3}$. Therefore:

$$R = \left\{ \frac{a}{b} \mid a \text{ and } b \text{ are integers, } b \neq 0 \right\}$$

5. Irrational Numbers: Irrational Numbers is the set of decimal numbers that neither terminate or repeat. These decimals cannot be expressed as a quotient of integers whereas the terminating and non-repeating decimals can. Examples of irrational numbers are pi and most square roots such as $\sqrt{2}$, $\sqrt{6}$, $\sqrt[3]{15}$. $\sqrt{25} = 5$ so $\sqrt{25}$ is a rational number.
6. Real Numbers: Since natural numbers, whole numbers, and integers all fall under the category of rational numbers and irrational numbers both fall under the set of real numbers. In other words, all numbers, no matter what they look like, are real numbers.

Examples:

1. Classify every set to which the following real numbers belong

$$123, 0, -1.2, \sqrt{7}, \sqrt{225}, -\frac{3}{4}, 4\frac{1}{2}$$

	123	0	-1.2	$\sqrt{7}$	$\sqrt{225}$	$-\frac{3}{4}$	$4\frac{1}{2}$
Natural	✓				✓		
Whole	✓	✓			✓		
Integers	✓	✓			✓		
Rational	✓	✓	✓		✓	✓	✓
Irrational				✓			

2. Identify the possible sets to which the following numbers belong:

$$-15, 29, -15\frac{2}{3}, 12.75, .009, \frac{9}{3}$$

	-15	29	$-15\frac{2}{3}$	12.75	.009	$\frac{9}{3}$
Natural		✓				✓
Whole		✓				✓
Integers	✓	✓				✓
Rational	✓	✓	✓	✓	✓	✓
Irrational						